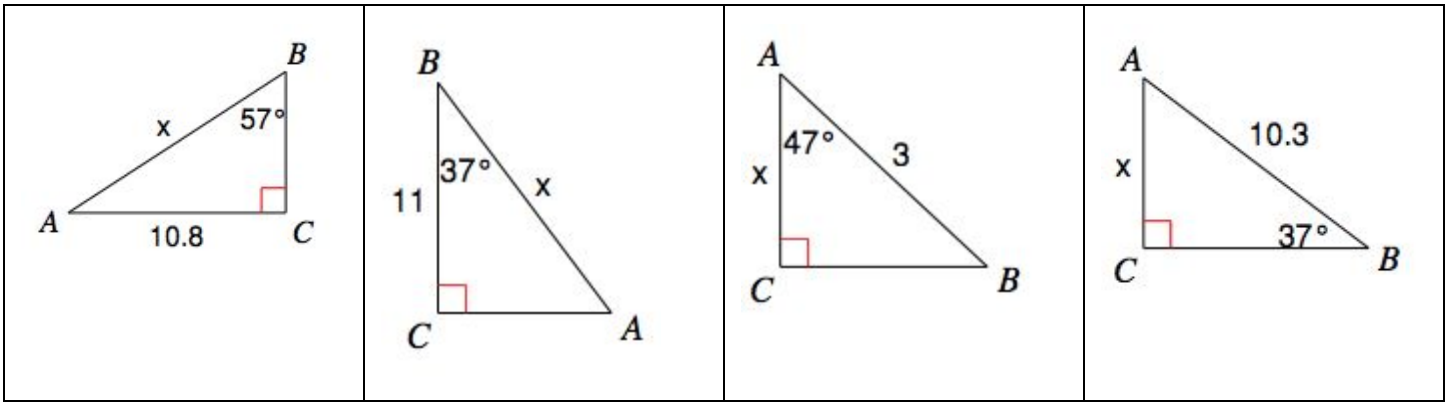
IM2 Problem Set 2.3 - Introducing the other Trigonometric Ratios

BIG PICTURE of this UNIT:	• How do I determine the measure of angles in geometric shapes, without direct measurement? • How do I solve for sides or angles in right triangles? • How can I solve problems that require geometric models using right triangles??

Part 1 - Skills Review

Work through the following 4 problems using what we know - the tangent ratio ….



What observations do you make? Which triangles are not (yet) possible to work in?

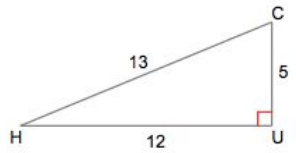
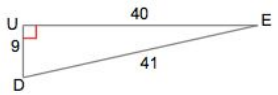
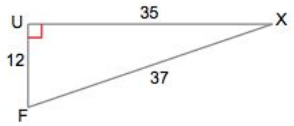
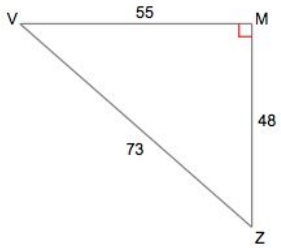
Part 2 – Skills & Concept Practice - New Ratios

We will thus introduce 2 new ratios to help us work through these new scenarios ... the sine and the cosine ratios

$$\text{sine of an angle} = \frac{\text{leg opposite of the angle}}{\text{hypotenuse}}$$

$$\text{cosine of an angle} = \frac{\text{leg adjacent to the angle}}{\text{hypotenuse}}$$

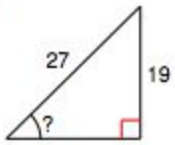
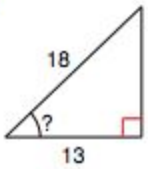
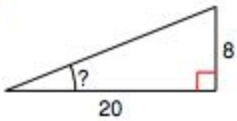
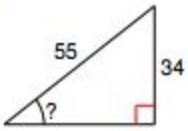
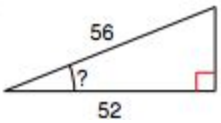
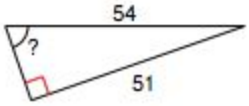
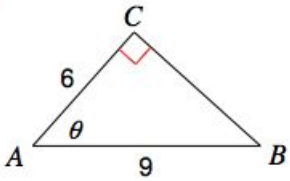
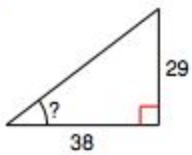
1. Work with the following triangles and state the value of the sine, the cosine and the tangent ratios of the specified angle. Then, determine the measure of the specified angle.

 sin(C) = cos(C) = tan(C) = sin(H) = cos(H) = tan(H) =	 sin(D) = cos(D) = tan(D) = sin(E) = cos(E) = tan(E) =	 sin(F) = cos(X) = tan(F) = tan(X) = sin(X) = cos(F) =	 sin(V) = cos(V) = tan(V) =

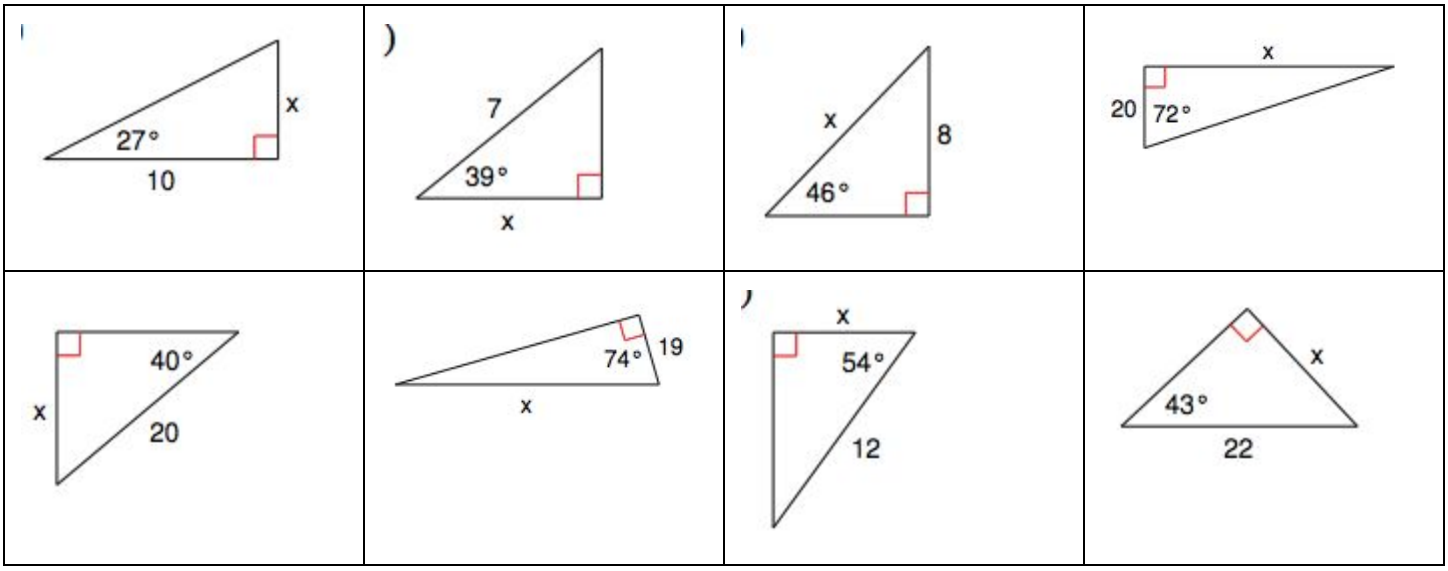
2. Working with our calculators. Make sure your calculator is in DEGREE mode. Enter the following into your calculator, record what values show up and explain what the values MEAN!!!

   a. i) sin(45°) ii) cos(30°) iii) cos(10°) iv) sin(60°) v) sin(78°) vi) sin(90°)
   b. i) $\cos^{-1}(0.1)$ ii) $\sin^{-1}(0.5)$ iii) $\sin^{-1}(0.2)$ iv) $\cos^{-1}(0.2)$ v) $\sin^{-1}(.75)$ vi) $\cos^{-1}(2)$

3. Given the following diagrams, determine which trig ratio would be applicable to solve for the required angle and then determine the measure of this angle as well.

4. Given the following diagrams, determine the length of the unknown side in the triangle.



Part 3 – Skills & Concept Applications

1. You are flying a kite and have let out 80 m of string. The kite's angle of elevation with the ground is 40°. If the string is stretched straight, how high is the kite above the ground?

2. A 40 ft flag pole has a rope tied from the top to the ground. The rope makes a 25° angle with the ground. How long is the rope?

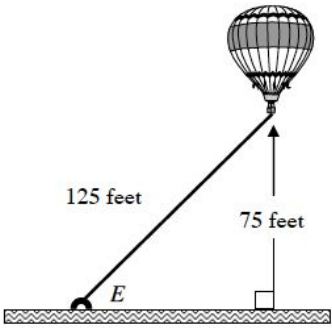
3. The sides of a rectangle are 25 cm and 8 cm. What is the measure, to the nearest degree, of the angle formed by the short side and a diagonal of the rectangle?

4. In an isosceles triangle ABC, AC and CB are each 15 centimeters. Angle A and angle B are both 55°. Find the length of AB, to the nearest cm.

5. The altitude of an equilateral triangle is 5 cm. What is the length of a side of the triangle?

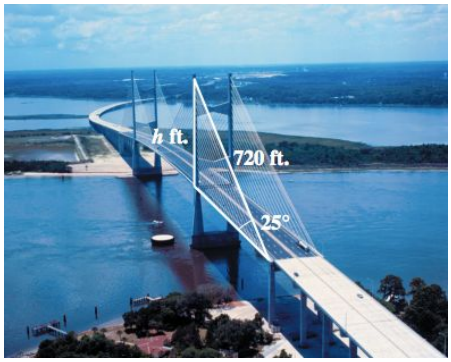
6. A damsel is in distress and is being held captive in a tower. Her knight in shining armor is on the ground below with a ladder. When the knight stands 15 feet from the base of the tower and looks up at his precious damsel, the angle of elevation to her window is 60°. How long does the ladder have to be?

7. A hot air balloon hovers 75 feet above the ground. The balloon is tethered to the ground with a rope that is 125 feet long. At what angle of elevation, E, is the rope attached to the ground? Round your answer to the nearest degree.



8. A fire department's longest ladder is 110 feet long, and the safety regulation states that they can use it for rescues up to 100 feet off the ground. What is the maximum safe angle of elevation for the rescue ladder?

9. The Dames Point Bridge spans the St. John River in Jacksonville, Florida. The longest cable supporting the bridge is 720 ft long and makes a 25° angle with the road. What is the height h of the pole?



10. In rectangle ABCD, diagonal AC, which is 20 cm in length, makes an angle of 35° with the base AB.

    a. Find AB, the base of the rectangle, to the nearest tenth of a cm.
    b. Find CB, the altitude of the rectangle, to the nearest tenth of a cm.

11. Pedro Mendieta operates the conveyor-belt machine used to haul materials to the top of the concrete mixing container. If the belt makes a 20° angle with the horizontal and ends 40 ft above the ground, how far do the materials travel to get to the top of the conveyor belt? How long is the belt?

Challenge Problem

Problem D
How are We Related?

Two circles, one with centre A and one with centre B, intersect at points P and Q such that $\angle PAQ = 60°$ and $\angle PBQ = 90°$.

How is the area of the circle with centre A related to the area of the circle with centre B?